

THE
UNIVERSITY
OF ARIZONA.

Register for 1892--93.

TUCSON, ARIZONA.
JUNE 1893.



N. B. Arrangements have been made with the Arizona Territorial Normal School at Tempe, whereby students from that Institution may have their record transferred to the books of the University with full credit, upon presentation of a certificate duly signed by the Principal. Students of this University may also obtain the equivalent privilege at the Normal School by presenting the proper certificate of standing signed by the President.



THE

University of Arizona.

"Each man must be a unit—must yield that peculiar fruit which he was created to bear."—Holmes.

"Come with us and we will do you good."

Second Annual Register 1892-3.

WITH

ANNOUNCEMENTS FOR 1893-4.

TUCSON, ARIZONA,
JUNE, 1893.

BOARD OF REGENTS.

EX-OFFICIO.

HON. C. M. BRUCE, Secretary of the Territory.

HON. T. J. NETHERTON, Superintendent of Public Instruction.

Appointed by the Governor of Arizona.

Rochester Ford, LL. B., Chancellor	Tucson
Merrill P. Freeman, Secretary	Tucson
Selim M. Franklin, Ph. B., Treasurer	Tucson
Herbert B. Tenney	Tucson

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Calendar, 1893-94.

1893.

March 7, Tuesday..... Winter Term ended.

March 8, Wednesday..... Spring Term began.

May 31, Wednesday..... Spring Term ended.

Sept. 21, Thursday. }	Entrance Examinations }	Through the Territory.
September 25, 26, }		At the University.
Monday, Tuesday. }		

September 27, Wednesday..... REGISTRATION DAY.

September 28, Thursday..... Fall Term begins.

November 30, Thursday } Thanksgiving Recess.
to	
December 3, Sunday. }	

December 23, Friday..... Fall Term ends.

1894.

January 3, Wednesday..... REGISTRATION, WINTER TERM.

January 4, Thursday..... Winter Term begins.

February 2, Friday..... Arbor Day Exercises.

February 22, Thursday..... Washington's Birthday.

March 16, Friday..... Winter Term ends.

March 21, Wednesday..... REGISTRATION, SPRING TERM.

May 30, Wednesday..... Memorial (Decoration) Day.

May 31, Thursday..... Spring Term Closes.

*Entrance Examinations, (unless otherwise announced) will be held Thursday, September 21, at Prescott, Flagstaff, Phoenix, Yuma, Tombstone, Wilcox, Globe, and Florence; and at other towns in Arizona, upon request.

Faculty of the University.

AND INSTRUCTORS.

THEODORE BRYANT COMSTOCK, D. S., **PRESIDENT.**

Professor of Mining and Metallurgy.

Director of the School of Mines.

FRANK A. GULLEY, M. S.,

Director of U. S. Agricultural Experiment Station.

Professor of Agriculture.

CHARLES BARNARD COLLINGWOOD, M. S.,

Professor of Chemistry.

JAMES WILLIAM TOUMEY, B. S.,

Professor of Biology.

EDWARD MARSHALL BOGGS,

Professor of Civil and Hydraulic Engineering.

HOWARD J. HALL, B. S.,

Acting Professor of English. Instructor, Preparatory School.

L. E. BENTON,
Acting Professor of Horticulture.
(Resigned April 1, 1893)

GEORGE LUKE HOXIE, M. E.,
Acting Professor of Physics and Mechanics.

*

*Principal, Preparatory School. Acting Professor of History
and Ancient Languages.*

MEADE GOODLOE,
Instructor of Assaying.

JOSEPH ANTON HEBERLY,
Instructor of Analytic Chemistry.

W. M. FOSS, B. M.
Instructor of Music.

GERTRUDE B. HUGHES, (Gr. N. E. Cons).
Instructor of Elocution and Physical Culture.

*

Instructor of Commercial Branches.

*

Instructor of Modern Languages.

*

Instructor of Stenography and Typewriting.

*To be appointed as required.

Location, Climate, Etc.

The University buildings are situated upon high ground about one mile from the business center of Tucson. They occupy a tract of forty acres, in a most healthy location, commanding a view of attractive mountain scenery upon all sides. The water supply is ample and of unusually pure quality, being drawn from a large well on the premises, 100 feet in depth.

Tucson has become a noted health resort, particularly for pulmonary patients, owing to the dryness of the climate and its freedom from sudden changes. The following data are taken from the records of the U. S. Weather Bureau office, by the courtesy of Mr. Wm. Burrows, Observer, and Director of the Arizona Weather Service.

"The climate here is so uniform that a record for any one month would afford a very reliable indication of what might be expected in the same month of every year. Precipitation is the only element which is subject to any great irregularity of periodic recurrence. The mean annual rainfall for ten years is a little less than thirteen inches, fully one half of which ordinarily falls in July and August, although occasional rains may occur in any month, and a much larger proportion than here indicated of the total for the year has been known to fall in December and January. Violent or destructive winds are unknown here."

The Table below has been compiled by Mr. Burrows from the records on file in his office at the University.

MONTH	TEMPERATURE.					Average Monthly Rainfall	Average Hourly Wind Vel	Average Num. of Clear, Partly Cloudy and Cloudy days in each month.		
	Mean Daily	Mean Daily Max.	Mean Daily Min.	Mean Daily Hum.	pr ct. Mean Kel.			Clear	Partly Cloudy	Cloudy
Oct.	68	84	53	30	0.14	8.6		24	5	2
Nov.	58	75	42	35	Trace	7.4		21	6	3
Dec.	45	60	30	47	0.25	7.5		20	6	5
Jan'y.	50	67	34	42	0.88	6.4		19	8	4
Feb'y.	54	67	40	58	1.72	7.0		13	8	7
March	56	70	42	54	1.07	7.8		17	7	7
April	63	80	46	34	0.09	7.9		23	5	2
May	70	87	54	29	0.46	8.4		23	6	2

Latitude 32 degrees, 14 minutes; Longitude, 110 degrees, 53 minutes; elevation, 2432 feet above sea-level.

HISTORY AND GOVERNMENT.

The organic law of the University of Arizona was passed by the Territorial Legislature in 1885. Under the provisions of this act the Board of Regents accepted a tract of land outside the limits of Tucson and formally located the institution thereon. The present Main Building, originally known as the School of Mines Building, was begun in October, 1887, but owing to insufficient funds, was not completed until 1891.

The endowment now available for educational purposes consists of two separate funds, as follows:

I. The Territorial Tax of about \$4500, to pay interest on bonds pledged to the University, annually levied. Available for building and general purposes.

II. The College Appropriation from the National Congress, increasing annually from \$15,000, to \$19,000 for the year 1893-1894, with provision for continued yearly increase of \$1000, until it becomes \$25,000 annually. Restricted to use for salaries and equipment.

Economical students should readily go through the year with from \$170 to \$200, excluding clothing.

Besides these sources of income, it is expected that provision will be made for grants of land for University purposes whenever Arizona becomes a State. The grant of \$15,000 per annum for an Agricultural Experiment Station is applied now by the Board of Regents in such manner as to give students in Agriculture added facilities for investigation and practical work. Efforts are being made also to secure similar advantages for the School of Mines by national endowment.

The Legislative enactment which established the University provided that—

“The University shall consist of five Departments:

FIRST—The Department of Science, Literature and the Arts.

SECOND—The Department of Theory and Practice, and Elementary Instruction.

THIRD—The Department of Agriculture.

FOURTH—The Normal Department.

FIFTH—The Department of Mineralogy and the School of Mines.”

In the fall of 1889, steps were taken by the Board of Regents of the University to comply with the laws regarding the acceptance by the Territory of the grant for an Experiment Station, and at the same time the College of Agriculture was established, the Director of the Experiment Station being made Professor of Agriculture in the University.

No classes were taught until October, 1891, when the University was opened for students with two of the “five Departments” fully organized. The School of Agriculture, with Professor F. A. Gulley, as Dean, and the School of Mines, with Dr. Theo. B. Comstock, as Director, have since been conducted as equal colleges, independent in certain respects, but combining their resources for purposes of instruction.

At a meeting of the Board, held June 15, 1893, Dr. Comstock was elected President of the Faculty, with duties and authority

similar to that of the President of other educational institutions, and at the same time the positions of Director of the Agricultural and Mining Experiment Stations were formally re-assigned to Professors Gulley and Comstock, respectively.

The separate work of these stations is still carried on, independently, as heretofore. All enquiries and correspondence relating to any branch of Agriculture or related branches, not connected with instruction, should, as formerly, be addressed to the Director of the Agricultural Experiment Station. All business for the Mining and Metallurgic laboratories should be sent, as before, to the Director of the School of Mines.

Correspondence upon matters affecting directly the University work should hereafter be addressed to the President.

UNIVERSITY ORGANIZATION.

The ultimate control of the University, in all its branches, for instruction and investigation, is vested by law in a Board, appointed by the Governor, of four Regents, one of whom is chosen Chancellor.

The Board of Regents has placed in the control of the Faculty the work of instruction and the discipline of the students. The President of the Faculty is charged with the assignment of work to the different departments and with the supervision of the buildings and grounds of the University. The educational policy and the executive work of the Institution are mainly in his hands.

The General Faculty is composed of the President and all the Professors, Acting Professors and Assistant Professors. For purposes of administration, Advisory Standing Committees, or Sub-Faculties, are appointed by the President to act upon matters particularly affecting their cognate work and to report upon such questions as may be referred to them by the General Faculty.

The Special Faculties are in one sense, collateral Colleges, made up of Schools, each with one or more Departments. The classification at present is as follows:

COLLEGES.	SCHOOLS.	DEPARTMENTS.
I.—The College of Agriculture	{ 1. AGRICULTURE..... 2. IRRIGATION	{ Agriculture. Horticulture. Irrigation.
II.—The College of Mines.	{ 1. SCHOOL OF MINES..... 2. CIVIL ENGINEERING.... 3. MATHEMATICS.....	{ Mining Engineering. Assaying. Metallurgy. Civil Engineering. Railroad Engineering Hydraulics. Pure Mathematics. Applied Mathematics.
III.—The College of Natural Science	{ 1. CHEMISTRY..... 2. PHYSICS	{ Chemistry. Physics and Electric Engineering.
	{ 3. BIOLOGY..... 4. GEOLOGY & MINERALOGY	{ Botany and Zoology. Geology. Mineralogy. Lithology.
IV.—The College of Letters	{ 1. ENGLISH LITERATURE... 2. MODERN LANGUAGES... 3. ANCIENT LANGUAGES... 4. HISTORY AND CIVICS....	{ Rhetoric English Literature. Rhetoricals. French Spanish. German. Latin. Greek. Modern History. Ancient History. Civics.
V.—The Preparatory School.	REGULAR COURSE. TWO YEARS.	
VI.—The Schools of Art	{ 1. SCHOOL OF MUSIC..... 2. SCHOOL OF PAINTING... 3. SCHOOL OF ELOCUTION.	{ Vocal. Instrumental, Crayon. Water Color. Oil.
VII.—The Schools of Business	{ 1. BOOK-KEEPING	
	{ 2. SCHOOL OF DICTATION ..	{ Phonography.
	{ 3. SCHOOL OF TELEGRAPHY	{ Typewriting.
	{ 4. SCHOOL OF PHOTOGRAPHY.	

SPECIAL FACULTIES FOR 1893-4.

The President of the Faculty, is *ex-officio*, Chairman of each of the Special Faculties. In his absence, the Professor first named on the list acts as Chairman.

I. COLLEGE OF AGRICULTURE—Professor Gulley, Professors Collingwood, Toumey and Boggs, and Instructor Heberly.

II. COLLEGE OF MINES—Professor Boggs, Professors Collingwood, Hoxie and ———, and Instructor Goodloe.

III. COLLEGE OF NATURAL SCIENCE—Professor Collingwood, Professors Toumey, Hoxie and ———, and Instructor Heberly.

IV. COLLEGE OF LETTERS—Professor Hall, Professors ———

The Instructors in the School of Art and in the School of Business are not members of the General Faculty. These schools are at present managed by separate Councils, made up of the Instructors, with the President of the Faculty as Director of each Council.

The Preparatory School is managed by the President of the Faculty, assisted by the Instructors in that School.

The General Faculty legislates for all students, including Preparatory students and those rated as Specials in Art and Business courses.

COURSES OF STUDY.

The experience of the last two years has shown that the demands from Arizona students for instruction are various and more or less conflicting with hard and fast lines, or general courses. The Faculty has, therefore, devised a plan which is believed to be in keeping with modern educational requirements.

In brief, the idea is to allow every student considerable latitude in electing his own studies, but with such wholesome restrictions as will prevent abuse of the system.

(See also, the "Combined Course," on another page, which provides for students who desire to pursue a general Literary and Scientific course.)

The Schools at present established, are as follows:

- I. Agriculture.
- II. Chemistry.
- III. Mining and Metallurgy.
- IV. Mathematics.
- V. Biology.
- VI. Civil and Hydraulic Engineering.
- VII. English Language and Literature.
- VIII. History and Civics.
- IX. Physics and Electrical Engineering.
- X. Drawing.
- XI. Modern Languages.
- XII. Geology and Mineralogy.
- XIII. Ancient Languages.
- XIV. The Schools of Art.
- XV. The Schools of Business.

CLASSES OF STUDENTS.

Provision is made for two classes of Students. I. UNDERGRADUATE and II. GRADUATE.

I. UNDERGRADUATE STUDENTS may be *Regular* or *Special*.

All *Regular* Students are required to pursue enough subjects to occupy at least three hours per day of class-room work, or the equivalent of laboratory work. Two hours of laboratory work are counted equal to one hour of recitation.

Such Students, in the Freshman and Sophomore years, may

elect a *Principal subject*, which must then be pursued under the direction of the Professor in charge of that Department. This Professor shall then assign to each student under his immediate authority, enough work, in or out of his own Department, to occupy two-thirds of the student's required time. The remaining one third is to be assigned by the Faculty at the beginning of each term.

In the Junior and Senior years, one-half of the work may be assigned by the Professor in charge of the *Principal subject*, and one-half elected by the Student, subject to the approval of the Faculty.

All students who are candidates for degrees must secure full credits in all studies pursued, and must also have successfully pursued such subjects as may be announced in the Register, as leading to the particular degree desired. In the *Principal subject*, a higher standard is exacted than in *assigned* work of the student's course.

In each of the Schools of the University, there are provided distinct Courses, as outlined beyond. In every Department there are arranged:

1. A Preliminary, or Introductory, Course for beginners and for students who need only a general knowledge of a given subject.

2. A series of graded Technical Courses for those who make the subject their *Principal* study, and

3. Flexible Courses to meet the needs of Special Students.

The requirements of *Special* Students are:

1. That they be at least eighteen years of age, and furnish proof that they are, for some good reason, unable to register as Regular Students.

2. They must matriculate and pay the fee of \$5.00 upon entrance, and be subject in all particulars to Faculty control

and to the authority of the particular instructor under whom they work.

3. All students in the School of Art and the School of Business are classed as *Special*, and are subject to requirements 1, and 2, above. They are also required to pay the additional fees prescribed in the particular Department in which they receive instruction.

II. GRADUATE STUDENTS from this or other similar Institutions are admitted to particular Courses of advanced study by special vote of the Faculty in individual cases.

FELLOWS are graduates pursuing such study, who receive a limited compensation in consideration for work of instruction with the lower classes.

GOVERNMENT OF STUDENTS.

The facilities provided at the University are freely offered for the benefit of all earnest students, and it is the purpose of the Faculty to give full liberty of action, within necessary limits, to those who show themselves worthy of confidence. There is no petty system of espionage or rigid restraint. Young men and women who are capable of self-control are welcome to the privileges afforded, but such as prove unworthy will be promptly dismissed before their examples can do harm to others.

The friendship and sympathy of the professors are always extended according to merit, and rules are laid down only as they become necessary. So far as they will do it properly, the students are allowed to govern themselves.

The Students' Association, an organization to which all are eligible, has been formed by the undergraduates, including members of the Preparatory School. This is working harmoniously, and with good results in the direction of self-government.

Frequent Assembly Exercises, including Public Rhetoricals,

with addresses by members of the Faculty and invited speakers, serve to inculcate moral truths and to set forth clearly the principles of right living. Students in the Preparatory School are subject to more direct supervision by the Preparatory Council.

REQUIREMENTS FOR ADMISSION, ETC.

Applicants for admission to the Freshman Class in the University must be at least 16 years of age,* and must pass satisfactory examinations in English Grammar, Geography, U. S. History, Arithmetic and the rudiments of Algebra.

Admission to the Senior Preparatory Class is open to those Students, at least 15 years of age,* who successfully pass examinations in Elementary Grammar, Geography, U. S. History and Elementary Arithmetic

For admission to the Junior Preparatory Class pupils must be not less than 13 years of age, and be able to read and write satisfactorily, and otherwise show ability to pursue the work laid down in this Register.

ENTRANCE EXAMINATIONS.

The facilities and privileges of the University of Arizona are open to all qualified persons of either sex. Examinations for admission to the University and the Preparatory School will be held on Monday and Tuesday, September 25, 26, 1893, in the University Building. Similar examinations will be held in all prominent towns of Arizona, on or about September 21 (Thursday) at times and places to be announced in local papers. This procedure will enable persons living near Prescott, Phoenix,

*In special cases of Students unusually capable and well prepared, this regulation may be abrogated by vote of the Faculty.

Yuma, Tombstone, Willcox, Florence, Globe, Flagstaff, etc., to save the expense of a trip to Tucson until they know if they are able to enter.

Regular examinations for entrance at the beginning of the Winter and Spring Terms will be held only at the University, but if applications are received early enough from other places, arrangements may be made to meet the wants of such as desire to be examined elsewhere.

CONDITIONED STUDENTS.

Those who fail to pass in one subject only may be admitted with a "condition," which must be made up at the next regular Entrance Examination, or earlier. Unless excused by the Faculty, conditioned students will be required to pursue the subject in which they are delinquent with a regular class in the University or the Preparatory School.

ADMISSION TO ADVANCED STANDING.

Students from other Institutions of equivalent rank may be admitted to the higher Classes upon presentation of properly authenticated certificates showing clearly to the satisfaction of the Faculty that they are qualified to proceed with such work.

The Faculty desires to establish such relations with High Schools and other Educational Institutions as will enable it to accept their certificates without question. To this end presiding officers are respectfully requested to correspond with the President.

REGISTRATION OF STUDENTS.

All Students are required to register on Registration Day in the President's office. Each will receive a card indicating the classes which he is to attend, and a receipt for the matriculation fee, when paid. These papers must be presented to the several Professors before enrollment will be permitted. No changes in registration can be made without the consent of the Faculty.

TERM RECORDS.

The class standing of each student is determined by the instructor in charge. Regular Term Examinations (or Final Examinations) have been abolished by vote of the Faculty. The method of ascertaining the student's Term Record is left to the instructor and his report is in all cases final.

MONTHLY REPORTS OF STUDENTS.

Reports of standing in Classes and in Department, are regularly sent each month to parents and guardians, from the President's office.

DEGREES CONFERRED.

Students who have obtained full credit for the required work during four years (36 credits), will be given the degree of Bachelor of Science (B. S.) or Bachelor of Arts (A. B.), according to the character of the work done.

The advanced degrees of Master of Science and Master of Arts are conferred upon Bachelors, graduates from this University or from institutions of equivalent grade, who have successfully pursued a course of study marked out by the Faculty, requiring not less than one year.

The degrees of Civil Engineer, Mining Engineer, Irrigation Engineer and Electrical Engineer are open to graduates properly prepared, who have pursued special lines of post-graduate work in accordance with Faculty regulations.

Theses will be demanded of all candidates for advanced degrees.

MISCELLANEOUS.

MISCELLANEOUS.

Under this head are given such items of information as are constantly demanded from parents and students. A careful perusal will avoid much correspondence, and save annoyance. Any points which are not covered by these statements will be cheerfully explained upon request.

VACATIONS AND HOLIDAYS.

Beginning with the year 1893-94, short vacations (as per Calendar on Page 7) will be given at the Holidays and between the Winter and Spring Terms. The long Summer vacation begins about June 1st and continues until near the close of September.

All legal Holidays are observed by the cessation of ordinary University work, and the Thanksgiving Recess extends from the close of regular exercises on the preceeding day until the Monday morning following.

Appropriate exercises may be arranged by the Faculty for any of the legal Holidays, in which Students will be expected to join, if required.

Arbor Day has been formally adopted by the University Faculty, as the regular Anniversary, on which shall be celebrated the founding of the Institution, in connection with the ceremonies of tree planting.

FACULTY MEETINGS.

Regular meetings of the General Faculty and of the Councils are held weekly. Meetings of the Special Faculties take place monthly, in rotation week by week.

Students' individual petitions must be in the hands of the President before the hour of Faculty Meeting in order to receive attention same week.

Petitions from classes, or from any two or more of the Students, will not be acted upon by the Faculty unless presented *in writing* to the President, at least two days before the meeting at which action is desired.

STUDENTS' EXPENSES.

There is no charge for tuition in any of the Departments of the University, *except in the Schools of Art and Business*, where Instructors' Fees are exacted.

All Students, including those in the Auxiliary Schools, are required to pay *once only* (upon entrance), a Matriculation Fee of Five Dollars.

Charges will be made for materials actually consumed by students in the laboratories.

Board and room in the new Dormitory will be furnished at cost. Each Student, before assignment to quarters, will deposit money enough to cover cost of these items and laundry for one Term in advance. It is estimated that the amount required for the Fall Term will be about sixty dollars, and fifty dollars for each of the other Terms, but an effort will be made to materially reduce these rates.

Students in the Dormitory will be provided with simple furniture, including single bedstead. They will supply their own mattress, pillow, bed-clothing, towels, etc.; also wash-bowl, pitcher and slop-jar.*

The cost of board and room in the city of Tucson will average near twenty-five dollars per month.

Text-books required may vary in cost between five and ten dollars in different years of the course.

*Circumstances, for which the University authorities are in no degree responsible, have made it necessary to delay somewhat the completion of the Dormitory. If it be not ready for occupancy at the beginning of the Fall Term, 1893, it is the intention to provide temporary accommodations for all who may apply. No one need be deterred from coming on this account, as the provisional quarters will be as good as those contemplated in the Dormitory itself.

Economical students should readily go through the year with from \$170 to \$200, excluding clothing.

SPECIAL NOTICE.

Invalids cannot be received in the Dormitory, nor is it possible to make any provision for self-support of students, except to a very limited extent.

Further particulars, if needed, may be freely obtained by correspondence with the President.

It is especially requested that those who may desire instruction in Ancient Languages, Music, Painting and the branches taught in the Business Schools, will give early notice of their need, in order that we may know in advance what demands we shall have to meet this year.

Address all correspondence relating to the University to

THEO. B. COMSTOCK,

President of the Faculty.





DEPARTMENTS
AND
COURSES OF STUDIES.



DEPARTMENTS AND COURSES OF STUDY.

The several Colleges, Schools and Departments, which together constitute the University, as outlined on Page 12, are not independent organizations, but convenient divisions for administration and for the specialization of the work of the corps of instructors. Certain of the Schools belong to two different Colleges, but no Department is included in more than one School.

In the following pages the Colleges are arranged in the order of their establishment in the University.

I. THE COLLEGE OF AGRICULTURE.

THE COLLEGE OF AGRICULTURE.

Liberal provision has been made by the National Government for instruction in the sciences relating to the several branches of Agriculture. The appropriations received heretofore by the Territory of Arizona have been wisely expended, and there is no reason now for those students who desire this training to go elsewhere to obtain it. The Professors in this College have been specially chosen for their work, and in connection with the Agricultural Experiment Station they are constantly engaged in such practical studies as will give their pupils opportunity to learn the best methods of procedure, as well as the particular needs of Arizona in their line of work.

Without losing sight of the practice of the art, the courses open to Students are so arranged that the elements of a liberal culture will not be neglected, and at the same time much latitude of individual choice is allowed, as in other Colleges of the University.

As befits the region, especial attention is given to the important subjects of Irrigation and Water Supply.

The distinctive Schools are those of Agriculture, Horticulture and Irrigation, to which are added the adjunct Schools of Chemistry and Biology.

SCHOOL OF AGRICULTURE.

PROFESSOR GULLEY.

The Departments in this School are Agriculture, Horticulture, and Irrigation.

AGRICULTURE.

The equipment comprises the farms of the Experiment Station, with the machinery and appliances used in working them, work animals and other live stock, besides tools and instruments required for illustrative purposes.

COURSE I.—Lectures discussing general farm management, stock-growing, dairying, growth of forage crops, use of water in irrigation. Supplemented by

COURSE II.—Study of field work in progress on the Experiment Station grounds and on ranches in the vicinity of the University.

WINTER TERM.—*Ten hours per week.*

Required of all Students graduating in Agriculture.

PREPARATION REQUIRED:—Mathematics through Trigonometry and Surveying; Botany I, II, IV, V; Zoology, I, II, III, IV; Physics, I, III; Chemistry, I, Ia, III, IV, V, VI; Geology, I.

HORTICULTURE.

This Department is well equipped for its purposes, having at command the growing plants of the Experiment Station and its implements.

COURSE I.—Class-room and Laboratory work, embracing the study of the plants of the orchard and garden; their nature, habits of growth, care, cultivation, propagation and management when grown on a large scale; practical methods of treatment for insects and other enemies.

SPRING TERM.—*Ten hours per week in Class-room, Field and Laboratory.*

Required of all Students graduating in the College of Agriculture.

PREPARATION REQUIRED:—Botany, I; Physics, I; Mathematics, through Algebra.

COURSE II.—Continuation of preceding Course, designed to give the student a good knowledge of the principles of Horticulture, with practical work in propagating and growing plants, fruit culture and preparing fruits for market.

FALL TERM.—*Ten hours per week in Class-room and Laboratory.*

Required of all Students who are graduated in the College of Agriculture.

PREPARATION REQUIRED:—Botany, I, II, IV; Physics, I, III; Chemistry, I, Ia, III, IV, VII; Horticulture, I.

SCHOOL OF IRRIGATION.

PROFESSOR BOGGS.

The rapidly increasing importance of Irrigation in all parts of the West, and especially in Arizona, has induced the establishment of a Department of Irrigation Engineering, the purpose of which is to give thorough training in the theory and practice of engineering,

devoting particular attention to Hydraulics and other topics connected with Irrigation.

No line of work at the present day seems to offer a wider field or better opportunities for employment than the several branches of Irrigation; surely none requires a higher degree of skill and intelligence. Throughout the West conspicuous monuments to the incapacity and inexperience of engineers exist in the form of important Irrigation works which show defects in conception, errors in design, and mistakes and failures in construction. But this condition of affairs is fast changing; engineers of high standing are making Irrigation Engineering one of the recognized specialties of the profession. There is a growing demand for the services of men of ability and special training, who are qualified to act as engineers for the designing and construction of Irrigation works; as commissioners having charge of the conservation and apportionment of the water-supply, or as administrative officers for Irrigation companies.

The Professor in charge of this Department has been selected with especial regard to his actual experience in Irrigation work, and it is intended to make this Course eminently practical.

It will include a theoretical and practical study of the principles of engineering in general, and make special features of Hydraulics, modern Irrigation Practice, Design and Construction of Canals and Reservoirs, Irrigation Law and Management, etc.

Throughout the Course due attention will be given to field work whereby the Student will receive thorough training in the use, care and adjustment of surveying instruments and of apparatus designed for gauging streams and canals, and for automatically recording fluctuations in water levels of streams and reservoirs.

The equipment of this Department consists* of the following: Three transits; two wye levels; solar compass; plain compass; clinometer hand-level; level, stadia and ranging-rods; engineer's chain; steel tapes; current meter with electric register; Colorado current meter; eleven water registers; hook gauge; aneroid barometer; chronometer; odometer; pedometer; planimeter; slide rule; drafting instruments; papers; apparatus for blue-printing, etc.

In addition to the general Library of the University, this Department has a well selected list of books on subjects pertaining to its work, which is supplemented by the private library of the Professor-in charge.

The list of periodicals on file in the Library contains many technical journals of value to Engineering Students.

Closely associated with the work of this Department of the University is the Agricultural Experiment Station, in which the Professor-in-charge serves as Irrigation Engineer. In this capacity he has in view a general investigation of the whole subject of Irrigation in Arizona, with regard both to its present condition and the possibilities of future extension. This inquiry will embrace a study of water supply, both surface and underground, the duty of water, methods of measurement and distribution, pumping plants, storage reservoir sites, silting of reservoirs and canals, compilation of statistics of mileage and service of canals and acreage irrigated, etc.

As this research proceeds, it is expected that occasions will arise whereby Students in the University may enjoy unusual opportunities to engage in field work and become familiar with the problems which arise in actual practice.

This Department invites contributions of maps, plans, photographs and descriptions of engineering works, and information concerning Irrigation methods and operations.

Such contributions will be carefully preserved and full credit given the donors in the publications of the Department.

The Courses of study are as follows:—

COURSE I.—*Rainfall and Water-Supply*.—Discussion of climatic and other conditions affecting rainfall and local drainage; topographic and other surveys required for irrigation and water supply projects; Irrigation Law and water rights; general principles of Irrigation practice.

ONE TERM.—*Five hours per week*.

Required of Students graduating in the College of Agriculture.

PREPARATION REQUIRED.—Physics, I; Chemistry, II, IIa (or I, Ia); Mathematics, through Trigonometry and Surveying.

COURSE II.—*Hydraulics*.—Lectures and field work, embracing the principles of hydrostatics and hydrodynamics, including units of measure, pressure of water, transmission of pressure, flow through pipes and orifices, over weirs, and in rivers, conduits, canals and sluices; measurement of water, gauging of streams, etc.

ONE TERM.—*Ten hours per week.*

Required of all Students graduating in the College of Agriculture and Mines.

PREPARATION REQUIRED:—Pure Mathematics, through Calculus; Applied Mathematics, through Topographical Surveying; Physics, II, III; Chemistry, I, Ia, III, IV, V.

COURSE III.—*Irrigation Engineering*.—Lectures and practice; collection and storage of water; laying out and operating tanks, canals, waste-weirs, resevoirs, etc.; principles and practice of designing and constructing earth-works, masonry dams, reservoir walls and other structures; maintenance of plant and distribution of water.

TWO TERMS.—*Ten hours per week.*

Available to Students who have had Irrigation, I, II.



II. THE COLLEGE OF MINES.



THE COLLEGE OF MINES.

The future wealth of Arizona, as in the past, must depend very largely upon the success of the mining industry. A strong public sentiment has demanded that this fact be made prominent in the means of training afforded in the University. Accordingly, Mining Engineering and related branches have from the start been given a leading position. That the facilities for instruction in these Departments are among the best is evidenced by applications received from all parts of the country for admission, and by letters commending the work already accomplished.

The demand for competent Mining Engineers is constantly increasing, and nowhere is this more apparent than in Arizona. Moreover, it is gradually becoming evident that the proper place for obtaining much of the most valuable training is in a region where mines abound.

No claim is made that students leaving this Institution as graduates will be fitted to immediately occupy responsible positions at the head of mining or milling establishments; but it is contended that those with proper qualifications will be so well trained in the College of Mines that they can very quickly acquire the needed experience.

The qualities which pertain to the make-up of a successful engineer are largely those of natural endowment, and no Institution can guarantee the success in practice of any who have received the benefits of its instruction. We can only promise the best possible work in the way of training.

It is confidently hoped that Congress will provide a special endowment fund for the Mining Schools, similar in purpose to that which is now provided for the Agricultural Experiment Stations.

In arranging courses for the different schools of the College of Mines, due attention has been given to studies which broaden the mind without unduly restricting the student's liberty of selection according to his individual needs.

Mining and Metallurgy constitute the leading features, but this being distinctively the Engineering College of the University, thorough preparation is also afforded in Civil Engineering, and to a considerable extent in Mechanical and Electrical Engineering.

The Distinctive Schools of the College of Mines are the School of Mines, the School of Civil Engineering and the School of Mechanical Engineering. The Adjunct Schools are those of Geology, Physics, Chemistry and Industrial Drawing.

SCHOOL OF MINES.

DR. COMSTOCK, DIRECTOR; INSTRUCTOR GOODLOE.

It is the determined purpose of the Director of the Arizona School of Mines to make this branch of the University subserve a two-fold object, namely:

First, the thorough training of young men in the sciences

and arts of Mining and Metallurgy, to such an extent as to fit them to undertake the development of the mineral resources of the country, after a supplementary period devoted to practical work.

Secondly, to make use of the laboratories for tests, experiments and investigations of practical utility to the mining industries.

Owing to the lack of any special provision of funds by either the National or Territorial government, the work of the second class named above is at present performed at some disadvantage, and it is necessary to rely, in a degree, upon the fees collected as a means of support. Full particulars concerning this branch of the service may be obtained from the Bulletins and circulars already issued from the office of the Director. The educational features of this School are herein set forth.

The School of Mines, at present under the immediate supervision of Dr. Theo. B. Comstock, has ample facilities for illustration of the various processes employed in mining work and of the principal methods of ore-treatment. Attached to the Main Building is an Annex, containing machinery and appliances for crushing, sampling, concentrating, amalgamating, leaching, chlorinating, and the electrical treatment of various kinds of ore in large or small lots. The student has access to this apparatus and is required to familiarize himself with its manipulation. Power is furnished from a seventy horse-power boiler, detached from the main building, the steam being carried underground to the engine-room, which contains a thirty-five horse-power engine, built by the Walburn-Swenson Manufacturing Co., of Ft. Scott, Kas., and a sixteen horse-power Westinghouse automatic engine, the latter being used for running the dynamo.

The mill building has a storage capacity for ore of fifty to one hundred tons. From the bins the ore passes to a chute from which it is elevated, by means of a three horse-power

electric motor, to the crushing floor above. A seven inch by ten inch Blake crusher is used for coarse crushing, and a Dodge crusher will be used for finer work. Beneath the Blake crusher is a set of fourteen inch by twenty inch Cornish rolls, from which the ore passes by a conveyor to the main elevator, which carries it up thirty-five feet to the top of the mill. By means of slides and chutes the crushed ore may be sent at will to various machines to be tested by different methods. For concentration there are provided revolving sizing screens giving facilities for preparing six sizes, besides hydraulic separators for classifying slimes into three grades. The coarser sizes may be worked upon full-sized jigging machines of the Hartz pattern, the finer sizes being jigged upon slide-motion machines, and the slimes being worked upon a double Rittinger percussion table, or otherwise, as desired. A small apparatus, run by electric motor, is also provided for dry concentration. Amalgamation tests may be made upon a working scale by different methods, including plates and riffles, pans and settlers, and special machines. Above the engine-room is the Electrical Laboratory, containing a seventy-five light Mather incandescent dynamo, from which six circuits are distributed to different parts of the University Building. Of these, two circuits are for lighting purposes; one extends to the hoisting motor; another to the motor which runs the concentrating machinery; another circuit to the fan motors used for ventilating purposes, and the sixth branch goes to the storage batteries which provide current for electrolytic work in the Assay Laboratory.

The Assay Laboratory is one of the most complete in the West in its appointments. This is equipped with assay furnaces for crucible work, for scorifying and cupelling, and for retorting mercury from amalgam. An adjoining room, supplied with water, gas and electric current, has a roomy hood for work involving fumes, with tables and desks for student work, besides all needed appliances for assaying by dry and wet

methods, including electrolysis. This room also contains an experimental desk and fittings for making working analyses of all kinds required in this department. A store-room for supplies adjoins this room, and a balance-room with fittings for the storage of pulp samples is convenient to this laboratory and to the main office. The balances and other special apparatus are of the highest grade, and they are rigidly set upon tables free from vibration, having no connection with any part of the building.

MINING ENGINEERING.

Field work and excursions to mines are made part of the training. Memoirs of practical character upon assigned subjects are required of students sufficiently advanced to prepare them.

COURSE I.—*Mine Surveying.*—Lectures, Recitations and Field Work.—History, uses and adjustments of instruments; solar compass and solar attachments; practical problems involving the running of surface and underground lines; connection of surveys above and below the surface; practice of U. S. Deputy Mineral Surveyors. Details of mine surveys; setting of bench-marks; running lines in shafts, drifts, stopes, etc.; maps, plans, sections; keeping of records. Surveys required to select locations for test-boring, shafts, adits, etc.; methods of reconnoitering.

ONE TERM.—*Ten hours per week.*

Required of Students graduating in Mining Engineering.

PREPARATION REQUIRED:—Pure Mathematics, through Trigonometry; Applied Mathematics, through Topographic Surveying; Physics, II, III; Drawing, I, II.

COURSE II.—*Mining Attack.*—Methods of exploration and

development of veins and other deposits; tools, implements, machinery and explosives, with principles governing their use. Methods of boring, sinking and driving through hard, soft, wet, dry and compact materials. Means of overcoming difficulties arising from dislocations and obstructions, such as faults, rolls, swells, caves, etc. Advantages and drawbacks in the English, Austrian, German, French, Belgian and American systems of excavation. Critical studies of the famous tunnels of the world. Variations required by differences in the objects sought.

ONE TERM.—*Five hours per week, with extra problems and drawings.*

Required of Students graduating in Mining Engineering.

PREPARATION REQUIRED:—Mathematics, through Mechanics; Physics, II, III; Chemistry, I, Ia, III, IV, V, VI; Drawing, I, II; Geology, I, II, III, IV; Mineralogy, I, II.

COURSE III.—*Exploitation.*—Support: objects and methods of timbering; framing, fitting, bracing. Winning of ores, coal and other materials: overhand and underhand stoping; winzes and intermediate levels. Drainage: pumps, pumping, sumps, ditches; drainage of working shafts and inclines. Ventilation: means and appliances; laws of various States and countries; discussion of fundamental principles and practical applications, with results. Transportation above and below ground: motors, cars, tracks, switches; cables, cages, safety attachments; haulage in inclines, "man-engines," etc.; tail-rope and other systems. Hoisting apparatus, air compressors and special mining machinery.

TWO TERMS.—*Five hours per week, besides problems and drawings.*

Required of Students graduating in Mining Engineering.

PREPARATION REQUIRED:—Mathematics, through Mechanics; Physics, II, III; Mining Engineering, II; Assaying (Metallurgy, I); Strength of Materials.

COURSE IV.—*Administration*.—Designing and construction of mining plant; setting, arranging, adjusting; preservation and operation, general economy. Organization of working force; economy of management; secondary superintendence; system of reports; division of labor and adjustment of responsibility. Prevention of accidents. Letting and measuring contracts; preservation of maps, plans and records. Mine book-keeping: accounts, forms, analyses, pay-rolls, cost-sheets, etc.

ONE TERM.—*Five hours per week.*

Required of Students graduating in Mining Engineering.

PREPARATION REQUIRED:—Mining Engineering, I, II, III.

METALLURGY.

Visits to mills and metallurgic works and the preparation of practical memoirs by the students form important parts of the training.

COURSE I.—*Assaying*.—A complete Practical Course, preceded by preliminary lectures. The student learns to prepare his own samples and to perform all the operations, from the making of the fire to the weighing of the bead, etc., in the fire assays, and from the start to the finish in the wet assays. The course is carefully graded so as to give the best results.

ONE TERM.—*Ten hours per week.*

Required of all students graduating in Mining and Metallurgy.

PREPARATION REQUIRED:—Physics, II, III; Chemistry, I, Ia, II, III, V.

COURSE II.—*Ore Dressing*.—Assorting, sampling, concentration; full discussion of principles, machinery and methods. Practical work in the mill.

PREPARATION REQUIRED:—Physics, II, III; Metallurgy, I.

COURSE III.—*Elements of Metallurgy*.—Lectures and

Laboratory Practice.—Analysis and discussion of fuels, fluxes etc. ; general conditions affecting economical results. Outlines of the Metallurgy of the principal metals. (Introductory to Course IV.)

ONE TERM.—*Ten hours per week.*

Required of Students graduating in Mining Engineering and Metallurgy.

PREPARATION REQUIRED:—Metallurgy, I, II.

COURSE IV.—*Metallurgy*.—Advanced course of Lectures, with Practice; detailed study of metallurgic processes in general use for the reduction of ores of all kinds. The student is made familiar with actual work on a commercial scale. In connection with this, he is required to design working plants and to make detailed reports of operations in the mill of the School of Mines.

ONE TERM.—*Ten hours per week.*

Required of students graduating in Metallurgy.

PREPARATION REQUIRED:—Mathematics, through Mechanics; Drawing, I, II; Metallurgy, I, II, III.

SCHOOL OF CIVIL ENGINEERING.

PROFESSOR BOGGS.

For those whose tastes and talent direct them to one or other branch of Civil Engineering, provision is made in special courses. The foundation work in Mathematics is equivalent to what is required of students in the School of Mines. A similar amount of Drawing is exacted, and the preparation in Physics is the same as in that School.

The time devoted to the theory and practical use of surveying instruments, to the work in Geodetic and Topographic Surveying and the important departments of Railroad and Hydrographic Engineering, is here substituted for much of the Chemistry and Geology and the other technical work of the Mining Courses.

The equipment in this School is fully up to the requirements, comprising compasses, transits, levels, rods, chains, tapes, solar compasses and attachments and a variety of aids to calculation, besides requisite drawing instruments of high grade, and facilities and apparatus for the reproduction of drawings.

COURSE I.—*Topographic Surveying*.—Theory and adjustments of instruments; problems in measurement of areas, distances of inaccessible points, etc. Use of stadia, plane table, transit and level. Practical field work.

ONE TERM.—*Ten hours per week.*

Required of Students Graduating in Civil Engineering, and in Mining Engineering.

PREPARATION REQUIRED:—Mathematics, through Trigonometry and Land Surveying; Drawing, I, II; Physics, II, III (in special cases, Physics I).

COURSE II.—*Railroad Engineering*.—Principles and practice of economic location; laying out of curves, tangents, crossings and switches; calculation of earth work. etc. Students are required to make actual surveys and to present notes, drawings and computations, as in regular practice.

ONE TERM.—*Ten hours per week.*

Required of Students Graduating in Civil Engineering.

PREPARATION REQUIRED:—Mathematics, through Calculus; Civil Engineering, I.

COURSE III.—*Geodesy*.—Methods and formulæ of barometric and trigonometric leveling, measurement of base lines; selection and

construction of stations, triangulation, running of meridians and parallels, map projection, etc.

ONE TERM.—*Ten hours per week.*

Required of Students graduating in Civil Engineering.

PREPARATION REQUIRED:—Mathematics, through Calculus; Astronomy; Civil Engineering, I.

COURSE IV.—*Bridge Analysis and Construction.*—Calculation of strains in bridges and framed structures, designing of road and railroad bridges, etc.

ONE TERM.—*Ten hours per week.*

Required of Students graduating in Civil Engineering.

PREPARATION REQUIRED:—Mathematics, through Mechanics; Strength of Materials; Drawing, I, II; Physics, II, III.

COURSE V.—*Hydraulics and Masonry Construction.*—[For the present, Civil Engineering students will take Course II (Hydraulics) and a part of Course III (Irrigation Engineering) in the School of Irrigation. [These cover practically the same ground as this course.]

EQUIVALENT OF ONE TERM.—*Ten hours per week.*

Required of Students graduating in Civil Engineering.

PREPARATION REQUIRED:—Mathematics, through Mechanics; Strength of Materials; Drawing, I, II; Physics, II, III; Chemistry, I, II, III.

SCHOOL OF MECHANICAL ENGINEERING.

ACTING PROFESSOR HOXIE.

The industries of Arizona are constantly demanding more and

better training of those who are to be entrusted with the mechanical details connected with the development of our resources. It is the purpose of the School of Mechanical Engineering to meet this growing want. The facilities afforded in the elementary work are all that could be desired, and as rapidly as the needs of students require, new equipment will be provided.

Students who may select this work will take full courses in Drawing, Physics, Mathematics (pure and applied), and later in their progress will receive instruction by lectures and in the laboratory on subjects relating to their profession.

Among the topics falling to be discussed in this series of lectures are: Materials of Engineering, Principles of Mechanics, Designing of Machines, Steam Engines and other Motors, Dynamos, etc., Hydraulic and Wind Engines, and the Study of Mill Work and Machinery.

A every important outgrowth from the courses here outlined must be, eventually, the School, or Department, of Electrical Engineering. Students with the proper preparation may branch off into such studies and pursue them as specialties. Our electrical equipment is already extensive and of the best.

SCHOOL OF MATHEMATICS.

PROFESSORS —————

As a means of mental discipline, the work assigned by the Faculty includes a liberal amount of the Pure Mathematics. The Engineering courses especially require thorough training in these branches and in Applied Mathematics.

PURE MATHEMATICS.

The range of work done in Pure Mathematics is indicated by the following outline:

COURSE I.—*Algebra*. (completed)—Beginning at Quadratics.

[Algebra is not completed as a Preparatory study. In cases where students are able to enter the University classes with a "condition" in Algebra only, they may be allowed to make up the deficiency after entrance, by pursuing the subject with a regular class in the Preparatory School.]

FALL TERM.—*Five hours per week.*

Required of all Regular Students in the University, Freshman Year.

PREPARATION REQUIRED:—University Entrance Examinations in full.

COURSE II.—*Geometry*.—Plane Geometry.

WINTER TERM.—*Five hours per week.*

Required of all Regular Students in the University, Freshman Year.

PREPARATION REQUIRED:—Mathematics, I.

COURSE III.—*Solid Geometry*.

SPRING TERM.—*Five hours per week.*

Required of Students in the College of Agriculture and College of Mines. Freshman Year.

PREPARATION REQUIRED:—Mathematics, I, II.

COURSE IV.—*Trigonometry*.—Plane and Spherical.

FALL TERM.—*Five hours per week.*

Required of Students in the Colleges Agriculture, Mines and Natural Science, Freshman Year.

PREPARATION REQUIRED:—Mathematics, I, II, III.

COURSE V.—*Analytic Geometry*.

WINTER TERM.—*Five hours per week.*

Required of Students in Engineering Courses of Colleges of Agriculture and Mines.

PREPARATION REQUIRED:—Mathematics, I, II, III, IV.

COURSE VI.—*Calculus.*

SPRING TERM.—*Five hours per week.*

Required of all Engineering students, Sophomore Year.

PREPARATION REQUIRED:—Mathematics, I, II, III, IV, V.

SCHOOL OF INDUSTRIAL DRAWING.*

ACTING PROFESSOR HOXIE.

The equipment of Drawing Tables, Instruments and Models is very complete. A progressive course of instruction is given in the use of instruments, line drawing, lettering, projection drawing, tracing and blue printing.

COURSE I.—*Instrumental Drawing.*

It is expected that the student who successfully completes this course will be competent to undertake any of the ordinary work of a drawing office, detail drawing, etc.

ALL THE YEAR.—*Nine, ten or more hours per week.*

Required of all Engineering students, throughout the Freshman Year; of Agricultural students, two terms, Freshman Year.

PREPARATION REQUIRED:—Course in Free-hand Drawing, unless by special exemption, for good cause shown.

COURSE II.—*Descriptive Geometry.*

ONE TERM.—*Five hours per week.*

*For instruction in Free-Hand Drawing, see under Schools of Art, beyond.

Required of all Engineering students.

PREPARATION REQUIRED:—Mathematics, I, II, III.

COURSE III.—*Kinematic Drawing*.—The study of Kinematics, the drawing of cams and the study of machine motions of different kinds on the drawing board.

ONE TERM.—*Nine or ten hours per week.*

Required of graduates in Mechanical Engineering.

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APPLIED MATHEMATICS.

Strictly speaking, much of the work of all the Engineering Schools involves the teaching of Applied Mathematics. What is here included covers only certain special branches which have been omitted elsewhere as being general in their application.

COURSE I.—*Mechanics*.

Required of Students Graduating in the College of Mines and in the School of Irrigation.

PREPARATION REQUIRED:—Pure Mathematics, I, II, III, IV, V, VI.

COURSE II.—*Materials of Engineering*.

Required of all Engineering Students, as with Course I.

PREPARATION REQUIRED:—Pure Mathematics, I, II, III, IV, V, VI; Applied Mathematics, I.

COURSE III.—*Strength of Materials*.

Required of Students as in Course II.

PREPARATION REQUIRED:—Same as in Course II, above.

COURSE IV.—*Astronomy*.

Required of Graduates in Civil Engineering, Mining Engineering and Irrigation.

PREPARATION REQUIRED:—All five Courses in Pure Mathematics; Physics, I, II, III; Geology, I, II.

Required of Students in Engineering Courses of Colleges of Agriculture and Mines.

PREPARATION REQUIRED:—Mathematics, I, II, III, IV.

COURSE VI.—*Calculus.*

SPRING TERM.—*Five hours per week.*

Required of all Engineering students, Sophomore Year.

Required of all Engineering students.

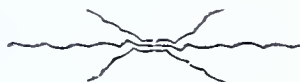
PREPARATION REQUIRED:—Mathematics, I, II, III.

COURSE III.—*Kinematic Drawing*.—The study of Kinematics, the drawing of cams and the study of machine motions of different kinds on the drawing board.

ONE TERM.—*Nine or ten hours per week.*

Required of graduates in Mechanical Engineering.

PREPARATION REQUIRED:—Industrial Drawing, I, II.





III. THE COLLEGE OF NATURAL SCIENCE.

THE COLLEGE OF NATURAL SCIENCE.

Modern life has derived its impetus and maintained its progress in very large measure from the cultivation of the sciences. Aside from the advantages arising from a knowledge of the facts, experienced educators now generally recognize that the methods of Science afford by far the best training for those whose object is to get broad culture as a preparation for business or the non-literary professions.

The Distinctive Schools of the College of Natural Science are Chemistry, Physics, Biology and Geology and Mineralogy. Regular students who elect one of these as a *Principal subject* will have such courses laid out by the Professor in charge, or by the Faculty, as will give a well rounded training. It is expected that the majority will register in this College and in the College of Letters, from which a combined General Course of study is made up and elsewhere presented.

SCHOOL OF CHEMISTRY.

PROFESSOR COLLINGWOOD AND INSTRUCTOR HEBERLY.

This School offers a series of courses designed to meet the needs of all classes of students. Its equipment is thorough and complete in every particular.

The Chemical Laboratories occupy the first floor and half of the second story of the south wing of the Main Building. On the ground floor is the Chemical Laboratory of the Experiment Station, fitted with gas, water, ventilating hoods and a complete equipment for all kinds of analytical work. Here

also are rooms which can be used for advanced students in quantitative work. The student will thus have the advantage of working in a laboratory where practical analytical work is being carried on.

On the second floor is the lecture room for qualitative and quantitative work. The room is so arranged that students may pass from recitation seats to laboratory desks and conduct the experiments which illustrate the lecture or recitation. Each student is provided with ample desk room, on which are reagent bottles, gas, water and pneumatic trough. Ventilating hoods are provided for boiling substances which give off injurious fumes. The rooms are well lighted and thoroughly ventilated. A complete set of apparatus for illustrating General Chemistry has been carefully selected for the instruction and use of students.

CHEMISTRY.

COURSE I.—*Elementary Inorganic Chemistry.*—Lectures (with Experiments) and Recitations. A brief history of Chemistry. The fundamental principles of the modern Chemistry. A study of the elements and their compounds. General cause of chemical combination, with daily exercises in chemical problems. Designed to acquaint the student with the general principles of the science.

Text Book, Remsen's Chemistry, Briefer course.

FALL TERM.—*Five hours per week.*

Required of all students graduating in the Colleges of Agriculture, Mines and Natural Science.

PREPARATION REQUIRED:—University Entrance Examinations.

COURSE Ia.—Laboratory work in General Chemistry. Chemical manipulations. Use of balance. Experiments performed by the student illustrating lectures in course I. Separation of metals into groups. Simple tests for acids. Principles of acidimetry and

alkalimetry. Designed to illustrate Course I and to give an introduction to laboratory work in Chemistry.

FALL TERM.—*Five hours per week.*

Required of all Students graduating in the Colleges of Agriculture, Mines and Natural Science.

PREPARATION REQUIRED:—University Entrance Examinations.

COURSE II.—*Elementary Organic Chemistry.*—Lectures and Recitations. An introduction to the study of the chemistry of the carbon compounds. General outline of the subject. First two members of the paraffine series and their derivations. Brief study of the remaining members of this series. Mixed compounds. Carbohydrates. Benzene series.

Text book, Remsen's Organic Chemistry.

WINTER TERM.—*Five hours per week.*

Required of Students Graduating in the College of Natural Science.

PREPARATION REQUIRED:—Chemistry, I.

COURSE IIa.—*Laboratory work in Elementary Organic Chemistry.*—To supplement Course I (with experiments performed by the student). Determination of melting and boiling points. Manufacture of simple organic compounds.

WINTER TERM.—*Five hours per week.*

Required of Students graduating in the College of Natural Science.

PREPARATION REQUIRED:—Chemistry, I.

COURSE III.—*Inorganic Chemistry (Experimental and Applied).*—Lectures and Recitations. History of Chemistry. The atomic theory. The periodic system. Study of elements and compounds with their relations to one another. Lectures on applied Inorganic Chemistry.

Text books, Remsen's Advanced Course and Richter.

Reference books: Von Meyer's History of Chemistry, Lothar Meyer's Modern Theories of Chemistry, Roscoe and Schorlemmer's Treatise on Chemistry, Thorp's Dictionary of Applied Chemistry, Wagner's Chemical Technology.

WINTER AND SPRING TERMS:—*Five hours per week.*

Required of Students Graduating in the Colleges of Agriculture, Mines and Natural Science.

PREPARATION REQUIRED:—Chemistry I, and Ia.

COURSE IV.—*Qualitative Analysis*.—Lectures and laboratory work.

Text books, Douglas and Prescott, and Fresenius' Qualitative Analysis.

FALL AND WINTER TERMS.—*Ten hours per week.*

Required of Students Graduating in the Colleges of Agriculture, Mines and Natural Science.

PREPARATION REQUIRED:—Chemistry, I, Ia, III.

COURSE V.—*Volumetric Analysis*.—Lectures and Laboratory work. Calibration of burets. Alkalimetry and Acidimetry. Indicators. Making standard solutions. Analysis by oxidation and precipitation.

Text book, Sutton's Volumetric Analysis.

SPRING TERM.—*Ten hours per week.*

Required for Graduation in the Colleges of Agriculture, Mines and Natural Science.

PREPARATION REQUIRED:—Chemistry I, Ia, III, IV.

COURSE V.—*Quantitative Analysis*.—Lectures and Laboratory work. After attaining some proficiency in the principles of quantitative analysis the student will be allowed to pursue such work as pertains to his chosen profession.

Text books: Cairn's Analysis, Fresenius' Quantitative Analysis.

FALL AND WINTER TERMS.—*Ten hours per week.*

PREPARATION REQUIRED:—Chemistry, I, Ia, III, IV, V.

COURSE VII.—*Organic Chemistry*.—(Experimental and Applied). Lectures and Recitations. A continuation of the study of the Chemistry of the carbon compounds, with lectures on its applications to industrial chemistry. Text and reference books: Hjelts' Principles of General Organic Chemistry, Richter's Organic Chemistry, Sadtler's Industrial Chemistry.

TWO TERMS.—*Five hours per week.*

Available to Students who have had Chemistry, I, Ia, III, IV.

COURSE VIIa.—*Organic Analysis*.—Lectures and Laboratory work. Determinations of molecular weights. Preparation of typical organic compounds.

TWO TERMS.—*Ten hours per week.*

Available to Students who have had Chemistry, I, Ia, III, IV, VII.

SCHOOL OF PHYSICS.

ACTING PROFESSOR HOXIE.

This occupies three large rooms on the ground floor of the University building.

In the northeast corner is located the Physical Laboratory, in which the students work. Adjoining this on the west are two rooms, one of which is used as a lecture and class room, the other as a store-room for apparatus.

The lecture room is provided with all the accessories needed for experimental demonstrations, such as gas, water, solar and electric lanterns, electric currents of any desired strength, etc.

The windows are provided with shutters, making it possible

to darken the room whenever experiments require it.

The Physical Laboratory is provided with tables set through the floor, giving a firm foundation for delicate instruments. Some of the apparatus, as Atwood's machine, pendulums, etc., is permanently fixed in this room, but more is brought in as needed.

The collection of apparatus available for instruction in this School is of the most complete description, especially that pertaining to Electricity. It includes a large Mather dynamo, (of $7\frac{1}{2}$ H. P., 75 lights); a small hand dynamo; a number of motors of different sizes; a very fine Helmholtz-Gauguin galvanometer; a Deprez-D'Arsonval reflecting galvanometer; a portable testing set for measuring resistances; several galvanometers for students' use; Wheatstone's bridges; Ampere's table; a large air pump with accessories; hydraulic ram; whirling table; photometer; lenses; prisms; mirrors; and a large list of other instruments.

COURSE I.—*Elementary Physics.*—[For general students, who do not require more than a cursory view of the subject.] Comprises the whole range of the Science in outline, covering the divisions of Mechanics and Heat, Electricity and Magnetism, Sound and Light. This course is intended to meet the needs of those who have not the time to pursue more extended study. It may also be taken with advantage by those who wish thereby to lay the foundation for a more thorough course.

FALL TERM.—*Five hours per week.*

Required of students Graduating in the College of Letters, and of those who pursue the "Combined Course."

PREPARATION REQUIRED:—University Entrance Examinations.

COURSE II.—*Engineering Physics.*—Lectures and Recitations, in which all the more important phenomena are fully illustrated by experiments. The subjects pursued are the same

as in Course I, but the treatment will be much more thorough.

FALL, SPRING AND WINTER TERMS.—*Five hours per week.*

Required of students Graduating in the College of Mines and Agriculture.

PREPARATION REQUIRED:—Mathematics, through Algebra, and preferably through Trigonometry.

COURSE III —*Physical Laboratory.*—Actual work and experiments by the students in all branches of Physics. Full notes of observations, with written report on each experiment, are required.

WINTER AND SPRING TERMS.—*Ten hours per week.*

Required of Graduates in the College of Mines and in the School of Irrigation of the College of Agriculture.

PREPARATION REQUIRED:—Physics, I; or Fall Term of Physics, II.

SCHOOL OF BIOLOGY.

PROFESSOR TOUMEY.

Ten courses are offered in this School, six in Botany and four in Zoology.

The Botanic and Entomologic class-room and laboratory occupy the southwest half, second story, of the south wing of the Main Building. These rooms are supplied with gas and water, rearing cages, insect cabinets, herbarium cases, aquaria, and a complete equipment for all kinds of histological work, including section-cutters, microscopes and accessories.

The collections comprise numerous type-specimens of plants and insects, besides a large amount of material from Arizona localities, procured by Professor Toumey on trips through the Territory. It is proposed to add as rapidly as possible representatives of all the groups of the Animal Kingdom.

BOTANY.

COURSE I.—*Structure and Morphology of Plants.*—Recognizing the fact that no real progress can be made until the student has learned to observe closely and correctly, the class is set to work upon living specimens from the local flora. Each student is given the use of a stand microscope and continues for some time the study of specimens directly under the eye of the instructor.

So far as is expedient, the plants selected for study are such as may be suggested by subjects in the books used for reference, including particularly the common and economic plants of the neighborhood. Study of the difficult subjects, such as ovules, seeds, and morphology of plants, is given special attention. Drawings in India ink, illustrating the various parts of the plant, and notes worked out by the Student in connection with these drawings, thoroughly fix the subject in the mind. The work is mostly of a Laboratory character, supplemented by Lectures and Recitations from Gray's Lessons in Botany.

FALL TERM.—*Nine hours per week.*

Required of Students Graduating in Agriculture and Horticulture.

PREPARATION REQUIRED:—University Entrance Examinations.

COURSE II.—*Systematic Botany.*—Practical work is given in the study of flowering plants, especially in relation to distribution, nomenclature and classification. Lectures are given once a week on the economic plants of the families studied. Plants of commercial importance and those useful or injurious to Agriculture in the Southwest, receive some attention.

Coulter's Botany of Western Texas, Brewer and Watson's Botany of California, and Gray's Synoptical Flora of North America, are used in this work.

SPRING TERM.—*Five hours per week, with field work once in every other week.*

Required of Students Graduating in Agriculture and Horticulture, and in regular Courses in Science.

PREPARATION REQUIRED:—Botany, I; Physics, I; Drawing, I.

COURSE III.—*Systematic Botany*, (advanced). Special study of the more difficult orders of Phanerogamic plants, and the identification and preparation of herbarium specimens. An herbarium containing a large number of Arizona plants is of considerable use to students in this work.

SPRING TERM.—*Five hours per week.*

Available to Students who have completed Courses I and II.

COURSE IV.—*Physiological and Anatomical Botany*.—Studies in the minute structure and physiology of plant life; work with compound microscope. Each Student is given the Laboratory use of the instrument during the term, and prepares his own slides and makes notes and drawings of the objects which he studies. A Lecture is given one day each week on the subjects previously studied, including the use and care of the microscope, cutting of sections, and on the Physiology of plants. In this course only the higher plants are studied.

Strausberger's Hand-book, Bessey's Text-book, Sach's Lectures and Goodale's Physiological Botany, are the principal books for reference.

WINTER TERM.—*Nine hours per week.*

Required of all Students Graduating in Agriculture and Horticulture.

Available to Students who have completed Courses I and II.

COURSE V.—*Cryptogamic Botany*.—In this work the student is mostly occupied in the Laboratory in the study of the lower plants.

Special attention is given to rusts and smuts and allied forms in their relation to plants of economic importance.

Some attention is given to ferns and mosses.

FALL TERM.—*Ten hours per week.*

Required of Students Graduating in Agriculture and Horticulture.

Available to those who have completed Courses I, II, and IV.

COURSE VI.—*Forage Plants and Forestry.*—This course is offered for those who wish to make a specialty of Botany. It varies somewhat in accordance with the wishes of the Student, but is given mostly to the study of such Botanical subjects as are of economic importance.

SPRING TERM.—*Five hours per week.*

Required of Students Graduating in Agriculture.

Available to those who have completed Courses I, II, and IV.

ZOOLOGY.

The Course in Zóology offers work in Comparative Anatomy Human and Comparative hysiology, General Zóology and Entomology.

COURSE I.—*Anatomy.*—Considerable attention is given to Human Anatomy. The work is illustrated by apparatus, diagrams and Anatomical preparations. A part of the term includes Laboratory practice, the Students making drawings and notes, illustrating their work.

SPRING TERM.—*Five hours per week.*

Required of Students graduating in Agriculture.

PREPARATION REQUIRED:—Physics, I; Chemistry I, Ia; Drawing, I.

COURSE II.—*Physiology*.—Lectures upon Human Physiology, some attention being directed to the Physiology of domestic animals. Some time is spent in the dissection of animals, in order that the Student may become familiar with the position and appearance of the various organs, and with the minute structure of tissues.

FALL TERM.—*Five hours per week, and two hours extra of Laboratory work.*

Required of Students Graduating in Agriculture.

PREPARATION REQUIRED:—Zoology, I.

COURSE III.—*General Zoology*.—Lectures and Text-book work on the Principles of Classification of Animals, their structure and development. Considerable time is occupied in Laboratory work, making dissections, and in the microscopic study of Animal Histology. The Geographic Distribution and habits of animals are given some attention.

FALL TERM.—*Five hours per week, and two hours extra of Laboratory work.*

Required of all students graduating in Agriculture and General Science.

PREPARATION REQUIRED:—Physics, I; Chemistry, I, Ia; Drawing, I.

COURSE IV.—*Entomology*.—In this study much attention is given to work upon Insects of economic importance. Lectures are given upon the Anatomy of Insects, their development, transformations, Geographical distribution and general classification. The study is pursued at the season when the Students can make collections illustrating the different Orders.

SPRING TERM.—*Five hours per week, and two hours extra of Laboratory work.*

Required of Students Graduating in Agriculture.

Available to those who have completed Zoology, I, II.

SCHOOL OF GEOLOGY AND MINERALOGY.

PRESIDENT COMSTOCK (temporarily).

MINERALOGY.

The Courses provided in this School are arranged to meet the needs of both general and professional Students.

It is intended to make the Museum of Geology and Mineralogy an adequate representative of the ores and minerals of Arizona, as well as a place for the deposit of everything illustrative of the practical working of the mines, mills and furnaces. A beginning has already been made in the donation of a valuable collection made by Professor Blandy, formerly Territorial Geologist, and by the deposit of the collections of Dr. Comstock. These last comprise many rare minerals from other regions, from which exchanges will be made with institutions and individuals so as to materially increase the variety of specimens.

The equipment is ample for all present purposes, and additions are constantly being made. The collections include fine samples of the modes of occurrence and of variations in the forms of minerals. This material is rapidly increasing by donations, and by gleanings from all parts of the Territory, a region unsurpassed as a field for the study of the important science of Mineralogy.

Instruction in Mineralogy comprises thorough courses in Crystallography, Determinative Mineralogy, and Blow-pipe Analysis. Special attention is given to Laboratory work, in which the Student is made familiar with a great variety of minerals.

The Comstock Collection contains much material from Eastern localities, and a full suite from the Yellowstone National Park, besides a variety of ores from Texas, Arkansas and other regions.

The Courses given this year will depend upon the number and preparation of the Students applying for instruction.

COURSE I.—*Physical Mineralogy and Blow-pipe Analysis*—Crystallography, and Physical and Chemical properties of Minerals; determination of Metals, etc., by means of the blow pipe.

WINTER TERM.—*Five hours per week.*

Required of Students Graduating in Mining and Metallurgy.

PREPARATION REQUIRED:—Mathematics, (except in special cases), through Solid Geometry: Physics, II, (or I); Chemistry I, Ia, (more will be advantageous): Drawing, (as much as possible of Projection Drawing.)

COURSE II.—*Determinative Mineralogy.*—Laboratory work, involving the determination of the rare, as well as common minerals.

SPRING TERM.—*Ten hours per week.*

Required of Students Graduating in Mining Engineering and Metallurgy.

PREPARATION REQUIRED:—Mineralogy, I.

COURSE III.—*Petrography.*—Study of the intimate structure of rocks; preparation of thin slices; microscopic examination, etc.

FALL TERM.—*Ten hours per week.*

Available to Students who have had Mineralogy, I, II, and Geology, I, II.

GEOLOGY.

The instruction in Geology comprises both Class-room and Laboratory work, with which is combined a large amount of practical field work. Instruction will also be provided in Microscopic Petrography. A Geological survey of the Territory is in progress under the auspices of the School of Mines, and competent Students will be afforded opportunity for instruction in the methods of field work, Geologic and Topographic. A beginning has been made towards

the accumulation of collections in this department, and additions are rapidly being made from all parts of the country.

We desire to secure authentic data concerning the Geological structure of Arizona. Donations of specimens of rocks, fossils, minerals, etc., will be thankfully acknowledged.

The subject of Engineering Geology, or the relations of Geology to engineering work, is made especially prominent.

COURSE I.—*Physiography*.—Forms of relief in the earth's surface: Phenomena of Currents of Air and Water; general physical features and their distribution.

ONE TERM.—*Five hours per week.*

Required of Students Graduating in all Colleges of the University.

PREPARATION REQUIRED:—Physics, I (or equivalent); Chemistry, I, Ia.

COURSE II.—*Structural and Dynamic Geology*.—Review of Geognosy, and of the Agencies of change in the earth's crust; Earthquakes, Volcanoes, Thermal Springs, Geysers; Atmospheric and Sub-Aerial factors in structure, earth sculpture, and Metamorphism.

Required of Graduates in Mining Engineering, Civil Engineering and Agriculture.

PREPARATION REQUIRED:—Mathematics, through Trigonometry; Geology, I; Physics, II; Mineralogy, I, II.

COURSE III.—*Stratigraphic Geology*.—Review of the successive stages of Geologic History; method of reading the record; progress in the development of life on the earth.

Required of Students Graduating in Mining Engineering and in the College of Natural Science.

PREPARATION REQUIRED:—Geology, I, II; Botany, I, II; Zoology, III.

COURSE IV.—*Engineering (Economic) Geology*.—Practical relations of Geology to Agriculture, to the Arts and to the different branches of Engineering; distribution of ores, rocks and other deposits of economic value.

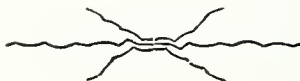
Required of those who Graduate in Mining Engineering.

N. B. This Course is advised for other Engineering Students, who may, in some cases, be allowed to take it with less preparation than is prescribed below, or to pursue a portion only of this allotted work.

PREPARATION REQUIRED:—Geology, I, II, III; Applied Mathematics, through Mechanics and Strength of Materials.

COURSE V.—*Paleontology*.—Ancient Life on the earth. Systematic review of Fossil Botany and Invertebrate and Vertebrate Paleontology, with particular reference to Stratigraphy and Historical Geology.

Available to Students who have taken Geology, I, II, III; Botany, I, II, IV, V; Zoology, III.



IV. THE COLLEGE OF LETTERS.



THE COLLEGE OF LETTERS.

The several Schools which together make up this College, are what would ordinarily be termed The Literary Division of the University. They comprise the three great Sub-divisions of Literature, History and Civics.

Students who contemplate engaging in the practice of the Law and those who desire to prepare for the Ministry as an ultimate profession will naturally select their *Principal* subjects from one or the other of these Schools. For such as may look forward to Journalism or to a political career, the College of Letters presents the best means of preparation, also. As elsewhere announced, the University Faculty has made up, from this College and from the College of Natural Science, a Combined Course, which is recommended for those whose minds are not clear as to their future avocations.

The Distinctive Schools of the College of Letters are: The School of English; The School of Ancient Languages; The School of Modern Languages; The School of History; The School of Civics.

SCHOOL OF ENGLISH.

PROFESSOR HALL.

Work in English is required of all Students in the University, excepting Special Students, at some part of their Course. The School will grow in Library equipment and in other ways as rapidly as the demands of Students.

For those who elect English as a *Principal* subject, a full Course of four years is provided.

COURSE I.—*Rhetoric*.—Aims, *First*, to give ease and force in the expression of ideas, particularly in exposition and persuasion; *Secondly*, to present in outline form that history of the English Language and Literature, which all English-speaking persons should possess.

FALL AND WINTER TERMS.—*Five hours per week.*

Required of all Graduates from the University.

PREPARATION REQUIRED:—University Entrance Examinations.

COURSE II.—*English Literature*.—Continuation of Course I.

SPRING TERM.—*Five hours per week.*

Required of all Graduates.

PREPARATION REQUIRED:—English, I.

COURSE III.—*Prose Writers of Nineteenth Century*.—Text-book, with Lectures and Discussions. Students will be required to choose works for individual study from the writings of the authors considered in class, reporting periodically.

FALL TERM.—*Five hours per week.*

Required of Graduates in the College of Letters.

PREPARATION REQUIRED:—English, I, II.

COURSE IV.—*Literature of Eighteenth Century*.—Same method as in Course III.

WINTER TERM.—*Five hours per week.*

Required of Graduates in the College of Letters.

PREPARATION REQUIRED:—English, I, II, III.

COURSE V.—*Elizabethan Literature*.—Method same as in Course III.

SPRING AND FALL TERMS.—*Five hours per week.*

Required of Graduates in Letters.

PREPARATION REQUIRED.—English, I, II, III, IV.

COURSE VI.—*American Literature*.—Students will provide themselves with some of the works of the most prominent authors. It is expected that a large amount of outside reading will also be done in connection with this Course.

WINTER AND SPRING TERMS:—*Five hours per week.*

Required of Graduates in Civics.

Available to those who have taken English, I.

COURSE VII.—*Translations from Ancient Literature*.—Studies of the best translations of the most celebrated works of Grecian and Roman writers.

FALL AND WINTER TERMS.—*Five hours per week.*

Available to those who have had English, I.

COURSE VIII.—*Ancient Classical Drama (translations)*.

SPRING TERM. *Five hours per week.*

Available to Students who have pursued English, I, II, III, IV, V.

COURSE IX.—*Elizabethan Drama*.

FALL AND WINTER TERMS.—*Five hours per week.*

Available after English, I, II, III, IV, V.

Class or Public Essays at least once each Term, in connection with the foregoing Courses, will be required of Students.

Public speeches will be required of all Juniors and Seniors, at least twice each year.

SCHOOL OF ANCIENT LANGUAGES.

INSTRUCTOR ———
—

Heretofore there has been no demand for instruction in Latin and Greek, but arrangements for this work are now such that students can receive adequate training in these branches also.

No definite Courses can be announced at present. Those who may desire to pursue classical studies will find it to their advantage to communicate with the President on the subject.

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SCHOOL OF MODERN LANGUAGES.

INSTRUCTOR ———
—

The instruction in French, Spanish and German is eminently practical, the object being to impart quickly a speaking knowledge and to enable the student to converse with ease. That this is readily feasible is proved by the experience of those who have been trained by this Natural Method. Classes will be formed for instruction according to requirements at the beginning of the year, and the conditions for admission will be made known at that time. It is probable that special fees will be exacted of students who elect a language as a specialty, instead of taking it as an adjunct to other work in the University.

No detailed announcement can be made until the requirements of students become known at the opening in September.

SCHOOL OF HISTORY.

PROFESSOR ———
—

A good foundation in History is provided in the Preparatory School. Advanced work in this branch has not been called for

urgently, but any demand which may be made can be satisfied promptly. It is confidently expected that a Professor will be selected especially for this work at an early date. Meanwhile, the subject is carried by the Principal of the Preparatory School.

Courses of study, as in other Departments, are being outlined. It is impossible to give these in detail at the time of going to press with this Register.

The following may serve as an indication of the scope and purpose of the instruction afforded.

I. Grecian and Roman History—Study of Government and People.

II. Mediæval History—Institutions of the Period from the 5th to the 15th century.

Details of these Courses will be announced at a later date. Enquiries should be addressed in the first instance to the President.

SCHOOL OF CIVICS.

THE FACULTY.

The term Civics, as here used, implies those principles which relate to the rights and duties of Citizenship. In one sense it covers much the same ground as is ordinarily included in College courses of "Political Science." At the same time, the object of the instruction is largely to inculcate patriotism and interest in public questions; to place before the student the highest possible ideals of our Republican institutions, and to formulate the correct methods of eradicating existing defects in our system.

For the present, the work of this School will be largely in the hands of President Comstock, who will deliver a course of lectures at stated intervals to all students in the University. Ar-

rangements for more extended work in this line are projected, to be introduced as soon as the needs of students may render it desirable.

Several of the members of the Faculty are Councillors of the American Institute of Civics, which organization affords hearty co-operation in this work.





THE (OMBINED) COURSE.

FOR STUDENTS DESIRING A LIBERAL
EDUCATION.



THE COMBINED COURSE.

The experience of the two years of operation of the University has clearly manifested the need of one fixed Course of Study suited to the wants of students who do not come to us with their life-work planned, but who require liberal culture as a preparation for usefulness in various avocations of a business or professional character.

Heretofore our courses have been strictly technical, and it has been necessary in consequence, to make them less flexible, and perhaps more irksome to certain pupils, than is conducive to the best success in training every student according to his individual make-up.

The Combined Course is here presented as a proper curriculum for the average student, as it embodies the judgment of the Faculty regarding what is most suitable for the broad general culture demanded by modern life. All students who are young enough to delay their technical preparation until after its completion are strongly urged to register in this Course. In some cases, this action may be

required as a condition precedent to matriculation, it being the purpose of the Faculty to place each student in the position best calculated to develop his or her talents and to most fully cultivate the power *to think independently*.

A careful perusal of the following outline will show that this Combined Course includes, practically, the elementary work of the principal Schools of the College of Natural Science and the College of Letters. The branches of Mathematics required are only those which will be assigned in any event, as a condition for graduation from all the Schools of the University. Thus nothing is required which a Regular Student can afford to miss, while the liberty of choice in the later years gives as much latitude as is consistent with prudence in selection.

This is not the Course for those who must quickly acquire a technical training to fit them for the professions at once; but it cannot be too strongly asserted that the time spent in this preliminary general training will be more than made up in the increased capacity for effective work in any field in the years to come.

FIRST, OR FRESHMAN, YEAR.

FALL TERM.—Algebra, [Mathematics, I]; English, I [Rhetoric]; Physics, I; Botany, I.

WINTER TERM.—Geometry [Mathematics, II]; English, I, [Rhetoric, continued]; Free Hand Drawing; Physics, III.

SPRING TERM.—Geometry [Mathematics, III]; English, II [English Literature]; Zoology, I.

SECOND, OR SOPHOMORE YEAR.

FALL TERM.—Trigonometry (Mathematics, IV); English, III [Prose Writers, 19th century]; Chemistry, I; Modern Language (or Latin).

WINTER TERM.—Chemistry, II; English, IV [18th Century Literature]; Modern Language (or Latin); Elective (any subject in College of Natural Science or College of Letters to which the Student is eligible at this stage of progress) five hours per week.

SPRING TERM.—History; English, V, [Elizabethan Period]; Modern Language, or Ancient Language; Elective, five hours per week (in Science or Literature, within range of eligibility).

THIRD, OR JUNIOR YEAR.

FALL TERM.—Geology, I, [Physiography]; English, V, continued; Modern or Ancient Language; Elective, five hours per week, (any subject taught in the University without fees, provided that it be available with the Student's previous preparation.)

WINTER TERM.—Mineralogy, I; English, VI, [American Literature]; Language, Ancient or Modern; Elective, as above, five hours per week.

SPRING TERM.—General History; English, VI, continued; Language, Ancient or Modern; Elective, five hours per week. *

FOURTH, OR SENIOR, YEAR.

FALL TERM.—Constitutional History; Elective, ten hours per week, of which one subject must be pursued as laboratory work, or in reading under the guidance of a particular professor. *

WINTER TERM.—Political Economy; Elective, ten hours per week, as in Fall Term. *

SPRING TERM.—Mental and Moral Philosophy; Elective, ten hours per week; Thesis.

Elocution, Physical Culture, Class exercises in Vocal Music and the routine Rhetorical exercises will be required in addition, as may be prescribed by the Faculty, throughout the Course.

* The choice of subject is made by the student, but may be refused by vote of the Faculty, if not deemed advantageous.

V. THE PREPARATORY SCHOOL.



THE PREPARATORY SCHOOL.

It is not the desire of the Faculty to engage in any work which can as well be done in the Public Schools of the Territory, but we have found it impracticable to dispense with classes designed to prepare students for the routine of the University. There is needed better foundation than the majority of applicants have hitherto possessed. The power of independent thought is essential to progress in University classes, and this is too commonly lacking in those who present themselves at the Entrance Examinations.

The Preparatory Course, occupying two years, has been especially designed for those who have not had sufficient training to enter the classes of the Freshman Year. It is not the intention to make this an equivalent to High School work, but simply a preparation for actual University courses. Thus all the work of the Preparatory years is arranged with an idea of pro-

gression from this School through any of the University courses.

Although this Course affords thorough training as far as it goes and provides a good foundation for future studies, it is not in any sense complete in itself. One of its main objects is to give training in the best methods of study, *to teach pupils to think*. In many cases, students lacking neither in zeal nor ability, are at a disadvantage in not knowing how best to direct their energies to the matter in hand. It will be the constant aim of the Instructors in the Preparatory School to overcome this difficulty, which experience shows to be particularly prevalent in the West.

Preparatory Students are subject to somewhat more rigid discipline than those in the University classes. They are amenable to the General Faculty, but come under the immediate supervision of the Preparatory Council, consisting of the President and the two Instructors in the School. Pupils study, as well as recite, under the eye of a teacher, and generally the methods of the School room, as distinct from those of the College, are followed.

THE PREPARATORY COURSE.

Below is given detailed information regarding the work of this School, after which appears the two years' Course in full. None of the work is elective, as in the University courses.

ENGLISH.—This subject is taught during every term of the Preparatory Course, its forms and methods being suited to the developing powers of the student. During the first terms it will be quite elementary, consisting mainly of language lessons and composition, special attention being paid to the expression of ideas with a view to bringing out the student's powers in this direction. During the middle terms more attention will be given to the structure of the sentence, together with composition; while in the latter terms the history and growth of the English language, and the main elements of which it is composed will be briefly considered. Narrative and descriptive

writing and the study of figures of speech and variety of expression will be the principal features of this later work. Meanwhile English classics will be read, an average of one hour each week being devoted to their study, which will be varied, to suit the comprehension of the student.

HISTORY.—*American History* occupies two terms. During the first term Colonial life will be studied. The habits and manners of the people will be made the subject of daily familiar talks for the purpose of bringing the social life and the ideas of the colonists before the student, as much as to give him a knowledge of historical facts. The work of the second term, embracing the period since the Revolution, will aim to give a clear view of the growth of the nation and the development of the ideas which have brought it to its present position.

General History in outline will occupy two terms. The first term will treat of the period from the earliest times to the fall of the Roman Empire. Here again, the civilization of the people will be made an important feature, especially while studying the history of Greece and Rome. The second term will cover in the same manner the history of Europe to the present time.

GEOGRAPHY. This subject will be presented during the first term for the purpose of giving an idea of the resources of the United States, their population and industries, the peculiar advantages and conditions of various sections, and to some extent the climatic and physical peculiarities. Foreign geography will be considered, but as a secondary feature.

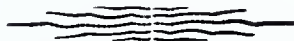
GOVERNMENT OF THE UNITED STATES. The one term devoted to this subject is, of course, not sufficient to give a scientific knowledge of the operations of our government, nor is the student at present prepared for such study. The subject is given here for the purpose of widening the general knowledge of the student as well as to better prepare him for the study of General History and Civics.

MATHEMATICS. *Arithmetic* occupies four terms, the first term being devoted to Mental Arithmetic and the three following terms to Written Arithmetic. The analytical method of study will be strictly followed throughout the Course, for the purpose of developing the reasoning powers.

Algebra will occupy two terms, during which the student will receive a firm grounding in literal notation. The work will be very careful and thorough, and original exercises for the student will form an important feature. The two terms' work will cover the subject to Quadratic Equations.

OTHER FEATURES.—It is impossible to outline completely the nature of the daily drill and personal influence brought to bear upon the student. Parents will naturally desire assurance that their sons and daughters will receive the best of care in these particulars during the years when the most important part of character forming is going on. We aim to make this above all, the primary consideration, and those interested will always be welcomed as visitors to the School room. The discipline, while strict and thorough, will be friendly and adopted to the individual needs of the pupils. High ideas of character will be inculcated and enforced in practice, but no attempt will be made to fit growing minds into ready-made groves. The constant effort will be to draw out and develop to the utmost, the peculiar talent of each youth and to show him how best to utilize his own individuality.

FEES.—Preparatory Students will pay the same fees as University Students, but the Matriculation Fee of \$5.00 paid for this School will *not* be credited as payment of the University Matriculation Fee in a later year.



COURSE OF STUDY.**JUNIOR YEAR.****FALL TERM.**

English. Language and Composition. Reading of English Classics.

Mental Arithmetic. As a mental drill.

Geography. Especially Resources and Physical condition of the United States.

WINTER TERM.

English. Language and Composition.

Arithmetic. Begun.

United States History. Colonial.

SPRING TERM.

English. Composition and Grammar.

Arithmetic. Continued.

United States History. Since the Revolution.

SENIOR YEAR.**FALL TERM.**

English. Composition and Grammar.

Arithmetic. Completed.

United States Government. Brief Descriptive Course.

WINTER TERM.

English. Lockwood's Lessons, or an equivalent.

Ancient History.

Algebra. Begun.

SPRING TERM.

English. Lockwood, continued.

Mediæval History.

Algebra. To Quadratics.

MISCELLANEOUS SCHOOLS.

Miscellaneous Schools.

To meet the expressed wishes of a considerable number of applicants, the Board of Regents has authorized the President of the Faculty to establish certain Schools for instruction in Art and in Business methods which, for the present, are to be conducted upon a different basis from the regular University Classes.

The Masters in these Schools rank as Instructors in the University, and, as such, they are members of the Councils in which they work. All students who register for work in these schools are listed as Specials, being thus amenable to the General Faculty, in a measure.

In addition to the Matriculation Fee exacted of all students upon entrance, Instructors' Fees are required of those who elect work in any of the Miscellaneous Schools, excepting when such work is prescribed as part of a University Course. These fees are payable in advance, term by term.

The University has no specific appropriation from which such Schools may be supported, and it is therefore necessary to make the fees mainly pay the expense of maintenance for at least the ensuing year. Such arrangements have been made, however, as will reduce these fees to the lowest possible limits.

The facilities offered this year are comprised in two groups known as the Schools of Art and the Schools of Business.

VI. THE SCHOOLS OF ART.



THE SCHOOLS OF ART.

In this group four Schools will be maintained, if enough encouragement be given in the number of pupils. A portion of the work laid out being in the nature of an experiment, the President reserves the right to defer the founding of one or other Department until such time as the applications will warrant its establishment upon a secure footing.

Music, Drawing and Painting, and Elocution may probably be all taught, even if the number applying be small, as favorable arrangements have already been made with competent instructors, and much of this work will also be required in some of the University Courses.

SCHOOL OF MUSIC.

INSTRUCTOR FOSS.

The instruction in Vocal and Instrumental Music, including the singing by the Students, is in charge of an experienced and accomplished Instructor, graduated from the New England Conservatory of Music in Boston, whose success hitherto is am-

ple guarantee of the high character of the work to be done in both these Departments.

Professor Foss will give such general instruction as may be required for the ordinary Assembly exercises to all students. No fees are charged for this, but any further training desired is subject to special fees, as per the Schedules of Rates announced below.

VOCAL MUSIC.

The subjects of Voice, Technic and Counterpoint are all given due attention. The Students, as a body, are given occasional practice in singing for the regular exercises in which they are expected to join. Selected persons will be taken for the choir and for solo singing on occasions demanding such performances. The latter will usually come from the number of those who take special work in Music, for which Instructor's fees are paid.

It is also hoped that enough talent will be developed to make it feasible to organize a University Glee Club during the current year.

SCHEDULE OF RATES.

Voice Culture and Development, two Lessons per week, Term of ten weeks.....	\$20.00
Sight Reading and Technic, two Lessons per week, Term of ten weeks.....	5.00
Class and Chorus Study, two Lessons per week, Term of ten weeks.....	5.00
Fees payable to the President, <i>invariably One Term in Advance.</i>	

INSTRUMENTAL MUSIC.

Complete instruction in the use of the Piano and Organ is given by Professor Foss. This being of necessity, individual in character, Students taking the work are amenable to fees. The charges given below are for the instruction alone. A moder-

ate fee will also be charged for use of instrument for practice, where this is provided for the pupil.

While no promises can now be made, if there should arise a demand for instruction in Violin and Orchestral Music, some provision will probably be made to supply it. A University band, as an outgrowth of this, would be given every possible encouragement.

SCHEDULE OF RATES, (for Piano or Organ.)

Per Term of ten weeks, one lesson per week.....	\$12.00
Per Term of ten weeks, two lessons per week.....	20.00
Per Term of ten weeks, three lessons per week.....	27.00

Fees payable to the President, *invariably one Term in Advance.*

SCHOOL OF DRAWING.

Free-hand Drawing is taught as a University and Preparatory study by Acting Professor Hoxie.

The Courses comprise Drawing from flat copies placed on the blackboard; Elementary Perspective; Model and Object Drawing, both in outline and shaded. This work is prescribed for most students, and in such cases, it may be taken without payment of special fees. Advanced work in designing and technical Free-Hand Drawing, when provided, will be subject to charges for Instructor's fees, as in other Departments in the School of Art.

SCHOOL OF PAINTING.

If enough applications be made, instruction in Crayon and Water Colors will be available to Special Students and to such Regular Students as may obtain permission from the University Faculty. In all cases the following Instructor's fees must be paid before engaging in the work:

SCHEDULE OF RATES.

One Lesson per week, Term of ten weeks.....	\$10.00
Two Lessons per week, per Term of ten weeks.....	17.00
Three Lessons per week, per Term of ten weeks.....	25.00
Four Lessons per week, per term of ten weeks.....	34.00

SCHOOL OF ELOCUTION.

INSTRUCTOR MISS HUGHES.

Much of the work undertaken in Elocution is required of all Regular Students, and for this no fees are charged. The Instructor, an honor graduate from the New England Conservatory of Boston, will also drill students for the ordinary exercises in which they appear publicly. Upon occasions of Prize Contests, and for special performances where wholly voluntary exercises are given, such drill will be available, but only by payment of Instructors' fees, according to an established schedule of rates.

The two Departments of Voice Building and Physical Culture are comprised in this School.

VOICE BUILDING.

The School of Elocution designs to make a thorough and systematic training of the voice a marked feature of its work.

The first year is one of continuous drill in all the elements of Vocal Expression; Vocal Physiology; Vocal Technique; Economy of the Breath; Methods of Delivery; Vocal Hygiene and Health Principles; Defects of Speech; Articulation and Pronunciation; Modulation; Inflection; Emphasis; Pitch; Quantity and Movement; Qualities; Application of Tone Effects; Analysis; Gesticulation; Physical Expression.

The second year's work will comprise one hundred and eighty Emotional Studies; Classification and Description of Groups of Emotions; Dramatic Analysis of Shakespeare's plays;

Range and Strength in Delivery; Flexibility of Voice; Light and Shade Effects in Tone; Pause Effects; Cultivation of the Imagination; Facial Expression; Principles of Gesticulation; Mechanics and Application of Gestures; Pose and Counterpoint.

PHYSICAL CULTURE.

The Course includes drills in

1. Light Gymnastics.
2. Aesthetic Gymnastics.

The Gymnastic drills are designed to give health, tone and vigor to the body, and to attain ease, precision and harmony in action.

TERMS FOR PRIVATE LESSONS.

One Lesson per week, per Term of ten weeks.....	\$10.00
Two Lessons per week, per Term of ten weeks.....	17.00
Three Lessons per week, per Term of ten weeks....	25.00
Four Lessons per week, per Term of ten weeks.....	34.00

Payable to the President, *invariably One Term in Advance.*



VII. THE SCHOOLS OF BUSINESS.



THE SCHOOLS OF BUSINESS.

The instruction contemplated in the Business Schools is comprised under the divisions of Book-keeping and Penmanship; Stenography; Typewriting; Telegraphy, and Photography (dependent upon the demands of Students).

Persons desiring instruction in any of these branches should make application early to the President, as the permanent establishment depends largely upon the interest manifested this year.

SCHOOL OF BOOK-KEEPING (and Penmanship.)

Writing Lessons may be taken with the Preparatory Classes by such persons as are authorized by the Faculty. Except in particular cases, no special fees will be exacted for this work.

Instruction in Book-keeping is open to Special Students registering in this School upon payment of Instructor's fees, which will be Five Dollars per term of ten weeks. This subject will be taught during one or two terms of the Collegiate year, and Students must begin with the Class.

SCHOOL OF DICTATION.

Phonography (Stenography), or "Short-hand" may be taken alone or in connection with Lessons in Typewriting. Instructor's fees will be exacted in addition to the Matriculation Fee of Five Dollars upon entrance.

OTHER BUSINESS SCHOOLS.

It is not believed that the demand for instruction in Telegraphy or Photography will justify the establishment this year of these Schools. If, however, any person should require work of this character, we shall be prepared to afford the necessary facilities for all applicants, our equipment of instruments and appliances in both Departments being especially complete. Further particulars may be obtained upon application to the President of the Faculty. Our equipment in both Departments is ample and modern.



Agricultural Experiment Station.

BOARD OF CONTROL:

The Board of Regents of the University.

STATION STAFF.

Frank A. Gulley, M. S.	-	-	-	-	-	<i>Director</i>
Chas. B. Collingwood, M. S.	-	-	-	-	-	<i>Chemist</i>
Edward M. Boggs,	-	-	-	-	-	<i>Irrigation Engineer</i>
James W. Toumey, B. S.	-	-	-	-	-	<i>Botanist, Entomologist</i>
Joseph A. Heberly,	-	-	-	-	-	<i>Assistant Chemist</i>
L. E. Benton*	-	-	-	-	-	<i>Horticulturist</i>
Mark Walker,	-	-	-	-	-	<i>Assistant Horticulturist</i>
Richard S. Stockton,†	-	-	-	-	-	<i>Stenographer</i>
Robert J. Ferguson,	-	-	-	-	-	<i>Engineer</i>
M. Moss, Phoenix Station,	-	-	-	-	-	<i>Foreman</i>

*Resigned April 1, 1893 † Resigned June 15, 1893.

The Agricultural Experiment Station is not an educational department, but it is under the control of the Board of Regents and the Station Staff is made up principally from the Faculty of the University.

The object and aim of the Station are to make investigations and carry on experiments in the interest of the Agricultural industry of the Territory.

A portion of the University grounds is used as one of the Field Stations, and Stations have also been established in the

Salt River Valley and near Yuma. The work of the Experiment Station will be utilized, as far as possible, as means of illustration for the Schools of the College of Agriculture, and thus made instructive and of value to Students.

The work of the Station includes testing plants, soils, waters, study of insect depredations, plant diseases, introduction of new plants, and making any investigation that is of interest to Farmers, Fruit-growers and Stockmen.

Correspondence is solicited. Bulletins are published giving results of work, and are mailed free to any applicant.

Address all communications to

PROF. FRANK A. GULLEY,
Director of the Experiment Station,
Tucson, Arizona.



The Weather Bureau.

The local office of the United States Weather Bureau, although not officially connected with the University, is located in the University building.

This office is equipped with the usual instruments and appliances employed by the Bureau for determining and recording the conditions of the various meteorological elements. The principal instruments in use are: Mercurial Barometers, ordinary Mercurial Thermometers; Maximum and Minimum Self-Registering Thermometers; a Thermograph, which registers automatically on paper a continuous record of temperature; a Photographic Sunshine Recorder, which shows the number of hours of sunshine each day; an Anemoscope; an Anemometer, with electrical self-recording attachment for indicating the velocity and total movement of the wind; a Hygrometer, for determining humidity and dew point.

Two observations are taken daily—one at 5 a. m. and one at 5 p. m. Each is enciphered and telegraphed immediately to Washington through the San Francisco office. A complete record of all observations is kept at the Station.

This is also the central office of the Arizona Weather Service, at which monthly reports are received from about forty sub-Stations situated in different sections of the Territory. These are condensed, compiled and published each month by Mr. William Burrows, the Director of the Service, in the attractive and valuable Arizona Weather Magazine.

From April until September a Weather and Crop Bulletin is published each week, based on the Meteorological and Agricultural conditions as shown by reports from numerous correspondents at different points throughout the Territory. These Bulletions are distributed freely to applicants.

Catalogue of Students.

Second, or Sophomore, Year.

Reid, Nellie.....	Tucson
Rouse, Charles O.....	Tucson
Shibell, Mercedes Anna.....	Tucson
Walker, Mary F.....	Tucson

First, or Freshman, Year.

Cameron, Brewster.....	Tucson
Cooper, William.....	Tucson
Etchells, Sadie.....	Tucson
Fish, Clara.....	Tucson
Graves, Fred.....	Tucson
Heaton, C. Edward.....	Tucson
Hughes, Thomas.....	Tucson
Jacobs, Hilda.....	Tucson
Kitt, Stanley J.....	Tucson
Hilzinger, Lulu.....	Tucson
Noble, Fred.....	Tucson
Orndorff, Bert.....	Tucson
Osborn, Mary.....	Tucson

Satterwhite, Raymond.....	Tucson
Shibell, Charles Barron.....	Tucson
Town, Frank C.....	Nogales
Walker, Mark, Jr.....	Tucson
Winnemark, Gottfried J.....	Tucson

Special:

Pickering, William.....	Assaying.....	London, England
Treadwell, E. D..	Assaying, Mineralogy...	New York, N. Y.
Williams, Neil.....	Chemistry.....	San Rafael, Cal.

Preparatory Year.*

Cameron, Helen.....	Tucson
Carrillo, Leonel.....	Tucson
Crandall, R. J.....	Tucson
Garcia, Alberto C.....	Tucson
Garrovo, Antonio.....	Tucson
Hartwell, Byron.....	Tucson
Hilzinger, George.....	Tucson
Jordan, E. E.....	Phoenix
Katzenstein, Millie.....	Tucson
Matas, Ada.....	Tucson
Noble, Paul.....	Tucson
Roca, Agricol.....	Tucson
Wetmore, Irene A..	Tucson

*The arrangement of two Preparatory Classes goes into effect this year for the first time. Prior to September, 1893, only one Class has been maintained in this School.

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